

Mount Forest, Ontario, Canada, 19th.

Poplar River, Montana, 20th: an auroral arch, with streamers reaching an altitude of 45°, was visible from 11 to 11.45 p. m.

Vevay, Indiana, 20th: a faint aurora, of crimson color, first appeared in the northwest at 8 p. m.; at 8.30 p. m. it passed to northeast. Diffuse flashes of white light issued from the north and extended to an altitude of 25°.

Cresco, Iowa, 20th: faint auroral beams were observed in the north at 9 p. m.

Fort Totten, Dakota, 21st: an auroral arch was visible in the north from 9.50 p. m. until midnight; altitude 25°, azimuth, 100°.

Mount Forest, Ontario, Canada, 21st.

Fort Yates, Dakota, 23d: a faint auroral display was observed at 11 p. m.

Vevay, Indiana, 23d.

THUNDER-STORMS.

Thunder-storms are reported to have occurred in the various districts on the following dates:

New England.—1st, 2d, 4th, 5th, 6th, 9th, 11th to 15th, 17th to 24th, 26th to 31st.

Middle Atlantic states.—1st to 5th, 7th to 10th, 13th, 14th, 18th to 23d, 25th to 31st.

South Atlantic states.—1st to 12th, 15th, 16th, 20th to 31st.

Florida peninsula.—1st to 31st.

Eastern Gulf states.—1st to 4th, 8th to 11th, 17th to 27th, 29th, 30th, 31st.

Western Gulf states.—1st, 3d to 7th, 9th to 30th.

Rio Grande valley.—3d to 7th, 10th, 14th, 15th, 18th, 21st, 22d, 23d, 30th.

Tennessee.—2d, 3d, 4th, 6th, 7th, 8th, 11th, 13th, 14th, 20th to 23d, 25th, 28th, 29th, 30th.

Ohio valley.—3d, 4th, 5th, 7th, 9th, 10th, 16th, 17th, 20th to 23d, 25th, 26th, 28th, 29th, 30th.

Lower lake region.—3d, 4th, 6th, 7th, 8th, 10th to 14th, 17th to 23d, 25th, 26th, 28th to 31st.

Upper lake region.—2d, 3d, 4th, 6th, 10th, 11th, 14th, 16th to 25th, 27th to 30th.

Extreme northwest.—1st, 2d, 5th, 12th to 19th, 22d, 24th, 27th, 28th, 31st.

Upper Mississippi valley.—1st, 2d, 3d, 5th, 6th, 10th, 14th, 16th to 25th, 27th, 28th, 29th.

Missouri valley.—1st to 5th, 7th, 11th to 22d, 24th to 28th.

Northern slope.—6th, 11th to 22d, 26th, 28th, 31st.

Middle slope.—1st to 7th, 10th to 24th, 26th to 29th.

Southern slope.—6th, 7th, 10th, 14th, 17th to 21st, 24th, 25th, 26th, 30th.

Southern plateau.—1st to 31st.

Middle plateau.—2d, 3d, 4th, 8th to 11th, 15th to 19th, 21st.

Northern plateau.—5th, 11th, 12th, 13th, 17th, 26th.

North Pacific coast region.—2d to 6th, 11th, 23d.

Middle Pacific coast region.—Salinas City, 3d; Red Bluff, 9th, 10th; Princeton, 9th, 10th, 11th; Hydesville, 11th.

South Pacific coast region.—Los Angeles, 3d; Cahuenga valley (near Los Angeles), and Poway, 3d, 21st, 22d; San Diego, 15th, 21st, 22d.

Professor H. A. Hazen, of the Signal Service, has prepared the following notes on thunder-storms for August, 1884:

Reports of special voluntary observers from north of 35° N. lat., and east of 102° W. of Greenwich:

The total number of reports filed up to September 18 this 2,226. Of these, the largest number were of storms on August 21st, 256; 22d, 183; 30th, 150; 4th, 194; 29th, 126; 20th, 104; 28th, 72.

The following general résumé is given, considering only the time of beginning of thunder:

On 2d, action was general in Minnesota, Wisconsin, Iowa, and Illinois. At 3 p. m., Washington time, storms prevailed in southeast of storm-centre and at a mean distance of 380 miles. At 11 p. m. they were south-southeast at a distance of 440 miles. On the morning of the 3d general action prevailed to the south of "low" at a mean distance of 600 miles. On the 4th general action is noted in Pennsylvania, New Jersey, Maryland, and Virginia, at a distance of 510 miles. In this instance the storms were very

numerous, beginning at 1 p. m., only two records having been received before that hour; there seems also to have been rather of an abrupt break at 7 p. m., there being only one record, and that in South Carolina, after that hour. On the 20th general action took place in Wisconsin, Illinois, Indiana, Iowa, and Missouri, to the south of "low" at a distance of 450 miles. Records begin at noon and end, as in the last case, at 7 p. m. Only one observation was recorded after 8 p. m., and that was in Arkansas.

On the 21st action was very general throughout the Ohio valley and middle Atlantic states. These storms began at 11 a. m., and continued up to 7 p. m. Mean distance from "low" of the storms in the former region was 660 miles to south-southwest, and in the latter region 470 miles to south.

On the 22d general action occurred, south and southwest of "low," and at a distance of 540 miles.

On the 28th general action is found at 7 a. m., and about 350 miles to southeast of "low."

On the 29th there were two distinct periods of general action; the first at 7 a. m., 550 miles south of "low," and the other about twelve hours later to the south and southwest of "low," distant 500 miles.

On the 30th general action is noted from 5 to 8 p. m. in the middle Atlantic states at a mean distance from "low" of 600 miles, and a mean direction of south.

The mean direction of 900 storms in this month was a very little west of south, and the mean distance from "low" was 515 miles.

ELECTRICAL PHENOMENA.

On the summit of Pike's Peak, on the 15th, the telegraph wires and other metallic objects produced a singular noise, being due to atmospheric electricity.

The observer at Fort Craig, New Mexico, reports the following: "A curious phenomenon was witnessed on the 17th, beginning half an hour before sunset and lasting one hour thereafter. A bright luminous arch, 1° in width and about 140° in length, was observed on the western horizon. During the time above mentioned the clouds were highly charged with electricity, and it was raining hard between the observer and the setting sun."

Mount Washington, New Hampshire: at 7.25 p. m. on the 26th the telegraph instruments were damaged, and the observer was severely stunned. As only distant lightning was observed previous to that time, the "cutting out" of the instruments, as is usually done during thunder storms, was not considered necessary.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various districts on the following dates:

New England.—12th, 18th, 20th.

Middle Atlantic states.—1st, 4th, 6th, 12th, 16th, 17th, 21st, 23d, 24th, 25th, 27th, 28th.

South Atlantic states.—6th, 15th, 17th, 21st, 27th, 28th, 30th.

Florida peninsula.—6th, 10th to 13th.

Eastern Gulf states.—3d, 6th, 7th, 8th, 10th, 24th.

Western Gulf states.—3d, 9th to 13th, 16th, 18th, 19th, 22d, 23d, 24th.

Tennessee.—6th, 21st, 22d, 25th, 27th, 28th, 29th.

Ohio valley.—3d, 5th, 6th, 12th, 15th.

Lower lake region.—1st, 3d, 24th, 25th, 27th, 28th.

Upper lake region.—24th, 27th.

Extreme northwest.—17th, 24th, 31st.

Upper Mississippi valley.—1st, 3d, 23d, 24th, 27th, 29th.

Missouri valley.—5th, 23d, 27th.

Middle slope.—9th, 10th, 15th, 18th, 20th, 21st, 24th, 25th, 26th.

Southern plateau.—9th, 21st.

Middle plateau.—3d, 12th.

North Pacific coast region.—29th.

Middle Pacific coast region.—1st, 6th, 13th.

LUNAR HALOS.

Lunar halos were observed in the various districts on the following dates:

New England.—1st, 3d, 28th.

Middle Atlantic states.—1st to 7th, 22d, 26th, 28th, 29th.

South Atlantic states.—2d, 3d, 4th, 11th, 27th, 28th, 30th, 31st.

Florida peninsula.—1st, 7th, 8th, 9th, 31st.
Eastern Gulf states.—1st, 4th, 30th.
Western Gulf states.—5th, 6th, 8th, 10th.
Rio Grande valley.—9th, 27th.
Tennessee.—5th, 6th, 8th.
Ohio valley.—1st, 3d, 4th, 6th, 25th, 26th, 27th, 30th, 31st.
Lower lake region.—2d, 6th, 27th, 29th.
Upper lake region.—2d, 10th, 14th, 26th, 27th.
Extreme northwest.—11th, 30th.
Upper Mississippi valley.—9th, 29th.
Northern slope.—7th.
Middle slope.—8th, 9th.
Southern slope.—4th.
Southern plateau.—1st, 4th, 27th.
North Pacific coast region.—3d.
Middle Pacific coast region.—1st, 28th.

MIRAGE.

Block Island, Rhode Island: on the 15th, the coast of the mainland appeared as perpendicular cliffs rising to an apparent height of seventy feet, and vessels were observed with their images, about forty feet above them, in upright positions.

Huron, Dakota: at sunrise on the 30th, a remarkably distinct mirage was observed, showing a clearly defined lake having shores dotted with farm houses, grain stacks, herds of cattle, etc. The phenomenon was a reflection of Lake Benton and the surrounding country, lying about forty miles east of Huron. The view both up and down the Dakota river was unobstructed for many miles, and presented a scene very rarely witnessed in this region.

Mirage was also observed at the following stations:

Yates Centre, Kansas, 8th.

Salina, Kansas, 20th.

Marquette, Nebraska, 4th, 28th.

MISCELLANEOUS PHENOMENA.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and sixty-two stations show 4,986 observations to have been made, of which four were reported doubtful; of the remainder, 4,982, there were 4,172, or 83.8 per cent., followed by the expected weather.

A peculiar appearance of the sky after sunset and before sunrise has been observed during the month of August, 1884. This phenomenon somewhat resembled that observed during the autumn of 1883, and the early winter months of 1884.

The following reports referring to this appearance have been received:

Alabama.—Professor P. H. Mell, Jr., director of the State Weather Service reports: "rosy sunsets were observed on clear days."

Arkansas.—Lead Hill, Boone county: sunset displays were observed on nearly every clear evening during the month, being especially bright on the 27th, 28th and 31st.

California.—Sacramento: a brilliant orange colored light covered the western horizon at sunset on the 31st.

San Francisco: the western sky was unusually red at sunset, and until 7.30 p. m. of the 31st.

Los Angeles: the western horizon presented a rosy red appearance after sunset on the 7th, 11th, and 15th. On the 26th and 27th, a bright red glow was observed after sunset.

Hydesville, Humboldt county: red skies after sunset were observed on the evenings of the 2d, 3d, 5th, and 31st; the display on the last-mentioned date being the most brilliant observed.

Colorado.—The observer on the summit of Pike's Peak reported red sunset on the 24th.

Dakota.—Webster, Day county: an unusually bright twilight

was observed on the 29th, lasting about forty-five minutes after sunset.

Huron, Beadle county: on the 4th the sky and sun had a blood red appearance, from the time the sun touched the horizon to thirty minutes afterwards.

Florida.—Archer, Alachua county: the sunrises on the 25th, 26th, and 27th, were as brilliant as the remarkable displays seen in December, 1883; the western sky at sunset on the 25th, 27th, and 29th, was also of unusual appearance.

Jacksonville: sky red at sunset on the 26th.

Georgia.—Forsyth, Monroe county: for thirty minutes before sunrise on the 29th, the eastern sky was of a deep vermilion color, surpassing in brilliancy any similar phenomenon seen at this place.

Atlanta: a red sky was observed at sunset on the 30th and 31st.

Illinois.—Swanwick, Perry county: the sunsets of the 30th and 31st were unusually bright.

Iowa.—Humboldt, Humboldt county: a beautiful sunset display was observed on the 22d.

Manchester, Delaware county: red sunsets were observed on the 4th, 5th, 22d, 25th, 29th, 30th, and 31st.

Muscataine, Muscatine county: brilliant red colors were observed in the eastern sky before sunrise on the 5th, 9th, 18th, 26th, and 30th; and the same phenomenon appeared in the west after sunset on the 5th, 9th, 10th, 18th, 25th, 29th, 30th, and 31st.

Kansas.—Manhattan, Riley county: twilights of unusual brilliancy and duration were noted on the evenings of the 29th and 30th.

Salina, Saline county: red sunsets, similar to those observed during the latter part of last year, appeared about the 20th.

Wellington, Sumner county: sunset afterglows were quite prominent on the evenings from the 27th to 31st; the colors were plainly defined and the duration of the displays was about one hour and forty-five minutes.

Kentucky.—Richmond, Madison county: red glows were observed in the western sky after sunset on the 5th, 18th, 29th, and 31st; the display on the last-named date was very bright and extended to the east.

Maine.—Portland: a peculiar, red sunset was observed on the 17th.

Massachusetts.—Somerset, Bristol county: at sunset of the 27th a red and orange colored glow covered the western horizon, paling toward the zenith; the display lasted forty-five minutes.

Michigan.—Manistique, Schoolcraft county: the sunset on the 26th was very brilliant, the colors being yellow near the horizon and red towards the zenith; the display continued for one hour after sunset. A bright yellow sunset was also observed on the 27th.

Minnesota.—Chester, Olmstead county: a beautiful twilight was observed on the evening of the 25th.

Saint Paul: from 7.50 to 9 p. m. of the 26th a segment of the southern sky for about 40° of the horizon and 20° altitude at the centre, was illuminated as though a great fire were raging in the distance. The red glow in the southeastern sky was also visible from 7.40 to 8.50 p. m. of the 27th, and from 7.55 to 9.10 p. m. of the 28th.

Montana.—Fort Assinaboine: the western sky was of a crimson color for thirty minutes after sunset on the 2d. The same appearance, lasting for twenty minutes, was observed after the sunsets of the 3d and 4th; and again for thirty minutes on the 7th.

Nebraska.—Red Willow, Red Willow county: a very brilliant sunset occurred on the 29th, the red glow extending to the eastern sky.

Yutan, Saunders county: the western sky at sunset on the 10th was of a brilliant red color; the same peculiarity was observed on the 29th, 30th, and 31st.

New Hampshire.—The observer on the summit of Mount Washington, reports that unusually brilliant sunsets of various colors were observed on the 7th, 12th, 17th, 18th, and 22d.